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FOR

10 **SYSTEM OF AUTOMATED CONFIGURATION OF NETWORK SUBSCRIBERS**

FOR BROADBAND COMMUNICATION

By

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SYSTEM OF AUTOMATED CONFIGURATION OF NETWORK SUBSCRIBERS FOR BROADBAND COMMUNICATION

Field of the Invention

The invention relates generally to the fields of digital communications and computer maintenance, and more specifically to a system and method for configuring personal computer systems for broadband communication.

Related Art

As Internet access becomes increasingly important and prevalent in our day-to-day lives, computer component manufacturers, software developers, and Internet service providers ("ISPs") continue to seek faster ways to communicate information across the Internet. The emergence of broadband technology, including DSL, ISDN, cable modems, and other broadband communication schemes are due in large part to this common goal.

"DSL" refers to various types of digital subscriber lines, the two main categories being "ADSL" and "SDSL". DSL technologies use modulation schemes to pack data onto existing copper telephone lines ("POTS"). DSL typically requires a short run to a central telephone office or stations, usually less than 20,000 feet. To access DSL, the user must install and configure a specially-adapted DSL modem.

"ISDN" is an abbreviation for integrated services digital network, an international communications standard for sending voice, video, and data over either digital telephone lines or POTS. ISDN supports data transfer rates of 64 Kbps (64,000 bits per second). Most ISDN lines offered by telephone companies offer two lines called B channels. One line may be used for voice and the other for data, or both lines may be used for data, resulting in data rates of 128 Kbps.

In a "Data over Cable" configuration, a cable modem operates over standard coaxial cable TV lines. Because the coaxial cable used by cable TV provides greater bandwidth than telephone lines, a cable modem can be used to achieve extremely fast access to the Internet. Cable modems that offer speeds up to 2 Mbps are currently available in select areas.

A problem common to all of the various broadband communication techniques is that the user's computer must be specially configured to access the service. Typically, a special modem must be configured, appropriate drivers installed, accounts established and other steps taken to implement the communication link. To compound the problem, all variations of broadband communication may not be available in a given locale. Moreover, because computer systems are very seldom sold ready for broadband communication, configuration often requires a service person to visit the physical location of the computer to configure it for access to a broadband network.

It has therefore become desirable to develop a new, automated method and system for configuring personal computers for broadband communication, as accomplished by the present invention.

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Brief Description of the Drawings

The present invention is illustrated by way of example and not limitation in the accompanying figures, in which like references indicate similar elements, and in which:

FIG. 1 is an exemplary block diagram of a personal computer's Internet access configuration containing narrowband access systems as well as broadband access systems;

FIG. 2 is a block diagram of an embodiment of the customer acquisition phase of the process automation of the present invention;

FIG. 3 is a block diagram of the service availability phase of the process automation of the present invention;

FIG. 4 is a block diagram of the order fulfillment phase of the process automation of the present invention; and

FIG. 5 is a block diagram of the subscriber conversion phase of the process automation of the present invention.

Description of the Preferred Embodiment

The following discussion is intended to provide a detailed description of at least one embodiment of the invention and should not be taken to limit the scope of the

invention itself. Rather, any number of variations may fall within the scope of the invention which is properly defined in the claims following this description.

The invention relates to an enhanced system and method for enabling personal computer to access to a broadband communication network using a more streamlined, automated process, as set forth in detail below.

There are many individual requirements for a successful subscription to a consumer broadband Internet service. Each of these requirements must be managed in concert to successfully achieve order fulfillment, software and hardware installation and account establishment. This process may be broken down into individual tasks and automated through the use of a software framework, such as the one described in U.S. Patent Application Serial No. 09/542,602, entitled "Broadband Service Control Network," filed April 4, 2000 (the "'602 application"), and incorporated herein by reference in its entirety. The automation framework therein disclosed may be used to control the various detection, testing, configuration and fulfillment tasks to provide a seamless and efficient process flow.

Fig. 1 depicts an exemplary consumer Internet installation, and illustrates the primary requirements for access of a broadband network. This figure illustrates a typical consumer internet access network with both narrowband (analog dial-up modem) and broadband support. The subscriber computer **1** contains a modem that supports narrowband **2** and broadband **3** or **11**. In addition, narrowband modem **2** has physical access to narrowband access network **7**, and broadband modem **3** or **11** has physical access to broadband access network **8**. In this example, the narrowband modem **2** is an industry standard analog modem device commonly used for consumer narrowband Internet access. The narrowband modem **2** utilizes the narrowband access network **7**, typically the POTS of the public dial-up telephone network, to gain access to an Internet Service Provider ("ISP") **5** and through that provider, the Internet **9**.

Still referring to **Fig. 1**, the broadband modem device **3** or **11** is an instance of a common broadband modem device installed within the subscriber computer **1**. Alternatively, the broadband modem device **11** may be an external device. In the case of the external broadband modem **11**, an Ethernet Network Interface Card **10** may be used to communicate with the external broadband modem **11**. No distinction is made as to the

broadband technology used by the broadband modem **3, 11** or the broadband access network **8**. For the purposes of this invention, all broadband Internet access technologies such as IDSL, DSL, and Data over Cable or wireless are equally applicable. Automation agent software **4** will be discussed below in connection with DSL to illustrate the present invention.

Note that the narrowband and broadband networks and access devices are shown to be present together in **Fig. 1** with dual access as a possibility. While this is not the typical model, this is possible through dual-modem cards. Furthermore, the present invention allows for the simultaneous presence of narrowband and broadband devices and provides for automated management of the subscriber system to use narrowband as a backup scenario should the broadband connection fail.

ISPs may provide narrowband access, broadband access, or both. Moreover, different types of broadband access may be provided. For purposes of discussion, the ISP **5** in the example is assumed to provide both narrowband access and broadband access to the same network resources, using the same basic subscriber account information. This model allows for minimal impact for the subscriber after the narrowband to broadband conversion. Consequently, the subscriber's email address and other account information would be able to remain the same with only the billing information and physical network details changing between the two access methods.

Also present in this example are automation agent **4** and automation server software **6** modules, which can be of the type described the '602 application, which is incorporated herein by reference in its entirety. The automation agent software **4** may be an embodiment of the "Active Agent" module as described in the '602 application, with additional logic to automate the requested broadband configuration and/or conversion process. Such additional logic is discussed below.

Similarly, the automation server **6** may be an embodiment of the "Service Mediator" module described in the '602 application, with extensions to control the automation agent software **4** in this network. Consistent with the '602 application, two optional deployment models are shown in **Fig. 1**. The ISP **5** may deploy the automation server **6** directly within its network. This model is indicated by the line connecting the ISP **5** to the automation server **6**. Alternatively, the automation server **6** could be located

outside of the ISP network and utilize the Internet **9** as its connection mechanism. This model is indicated by the connection lines between the Internet **9** and the automation server **6**.

Fig. 2 shows the first phase of the automated process--the customer acquisition phase. Broadband networks are typically not deployed to allow 100 percent access to all potential subscribers within a geographic region. Instead, broadband technology is typically deployed in a pattern such that discrete metropolitan areas are enabled for service by a localized upgrade of networking equipment by the broadband access provider. This deployment model means that a set of consumers may not initially qualify for broadband access service but may qualify later in time as the network is systematically upgraded. The process of acquiring this customer in a proactive manner is the initial process automation phase of this invention. Note that there are multiple models for this customer acquisition phase. Existing narrowband customers may be converted to broadband through this mechanism. New installations are also supported where no existing network connection exists and the customer is initially configured for broadband access.

Assume that the broadband network field operations staff has completed the network upgrade and updates the broadband network deployment database **21** to reflect the geographic region of subscribers that have been newly enabled. This information is transmitted to the automation server **6** The information is correlated to individual subscriber information by the automation server **6** and the resulting subscriber records are updated in the subscriber database **24**. Personnel of the ISP **5** may determine which of the individual subscribers should be targeted for the broadband upgrade, or it may be done automatically. One set of criteria for this selection may be the subscriber profile database and collection mechanism as described in the '602 application.

An alternate flow for the customer acquisition automation is possible where the automation server **6** directly accesses the broadband deployment database **21**. In this model, the subscribers may be qualified against the broadband deployment database **21** as desired by the ISP **5**.

The result of this data correlation is a list of consumers within the broadband network that physically qualify for broadband access service. Certain members of this

list may be existing narrowband customers who may be targets for conversion to broadband. Other members of the list will be consumers with no existing network access who may be targeted for broadband service initiation. It is assumed that the network service provider will use this list to actively market and engage these customers. As a part of this process, the agent software is made available to the consumer. Several options are possible for this deployment. The software may be actively distributed to the field through direct mailing or marketing methods. The software may also be resident on an internet based host and available for download by the consumer. The software may also be pre-loaded into the consumers PC by the manufacturer. Regardless of the delivery mechanism, the agent software is assumed to be loaded and available on the consumer's machine for the remaining automation processes.

The automation flow continues when a subscriber responds to the service provider's marketing efforts and requests broadband service. Several models exist for the specific flow but it is assumed that the active agent software on the subscriber's machine is activated. The agent software contains information and logic that enables the automation process to proceed during the initial phase where the subscriber machine **1** is not connected to the network. In this phase, the machine is tested and configured for the automation steps that follow. This may include the configuration of a baseline or default network access method. It may also include the detection and use of an existing narrowband access method. In any case, the goal of this automation is to facilitate the connection of the subscriber machine **1** to the automation server **6**. This begins a control dialog between the agent **4** and the server **6**. In this exemplary description, this dialog is of the nature described in the '602 application.

The dialog between the agent **4** and the automation server **6** is used to guide the subscriber to and step them through a service selection process where the requested broadband service is advertised and selected for purchase by the subscriber. The content and forms required for this direct sales mechanism may be located within the automation server **6** or within any traditional network hosting server within the ISP **5**. All of the variables and workflow of this process are managed through the control dialog between the agent **4** and the automation server **6**.

In any of the above cases, it is assumed that the subscriber selects a broadband service for purchase. At this point, the automation agent **4** will be notified when the user accepts the service offering through the control dialog with the automation server **6**. The next phase of process automation begins when the automation agent **4** receives this signal, and the subscriber installation then proceeds to the qualification stage discussed in connection with **Fig. 3**.

Fig. 3 shows an exemplary model for continuing the broadband configuration process by qualifying the subscriber computer and physical equipment for broadband service availability. The variety of service offerings in the previous phase might require differing levels of capability and conditions of the subscriber machine **1** and broadband connection for success. These requirements are contained as a workflow process within the automation server **6**, and are communicated to the agent **4** based upon the service that was selected. The automation agent **4** within the subscriber computer **1** is activated to perform this workflow process which represents a series of tasks that have been tailored for the specific broadband access network **8** and service offering desired. The definition of these tasks and the activation sequence may be under the control of a distributed control network, such as the one described in the '602 application. The service availability process could take several forms because it is dependent on the physical broadband media in use. Several options will be described here but it is not intended that all possible scenarios be listed in this document.

The automation agent **4** may be directly integrated with the internal broadband modem **3** or the external broadband modem **11** in such a way as to control and sense this device directly and determine broadband network availability. In other words, the modem **3** or **11** could be instructed by the agent software **4** to access the broadband network physical layer and collect the basic success or failure of this operation as well as the reporting of the various data elements associated with that individual broadband connection. This information will be collected by the agent **4** and communicated to the automation server **6** and/or used locally by the agent **4** to modify the automation workflow. Specifically in a Data over Cable installation, the agent could instruct the cable modem to detect carrier signal from the network and the signal strengths and error

codes that were detected during that connection attempt. This information would be collected and used as described above.

An additional test is possible for DSL deployments. The automated agent could use the narrowband modem **2** to contact a DSL line qualification server **38** to test the physical line outside the scope of the broadband access network **8**. The subscriber loop characteristics would be collected by the automation agent **4** and used as input to the workflow as described above.

All results of this service availability phase can be processed by the automation agent **4** for basic pass/fail status as well as potential quality of service information to be used during the subscription process. This information is then used to allow a confident decision to be made by the subscriber to purchase the service, and place a service order. Should the subscriber activate the order process, the next automation phase begins to fulfill that broadband service order.

As shown in **Fig. 4**, the next phase of the automated process fulfills the subscriber's order for the broadband service. This step includes all network provisioning, account and billing system updates such that the entire process from order placement to fulfillment is automated from the subscriber's perspective. Typical broadband order fulfillment requires several workdays between order placement and fulfillment. This is due to the fact that there are still individual tasks that must be manually completed by the service provider's field operations group. During this period, it is assumed that the agent software **4** is still resident on the subscriber's machine and is periodically able to establish a connection to the automation server **4** or other control host within the ISP network. The agent software **4** may utilize the dial-up Internet connection using the existing narrowband modem **2** and the narrowband access network **7** to the ISP **5** or the broadband modem device **3** or **11** in its baseline or default configuration mode. The purpose of this connection is to establish the control dialog between the automation agent **4** and the automation server **6** for additional status and workflow instructions as the fulfillment process proceeds.

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The automated order fulfillment process begins with the automation agent **4** communicating the order request and all service availability information obtained during the previous automation phase to the automation server **6**. The automation server **6** then

begins a workflow process to complete the ordering process for all physical network assets as well as all account and billing database updates. The automation server **6** collects all subscriber and broadband modem provisioning and configuration information and transmits this information to the activation agent **4** through the control dialog connection as described above. Note that this final sequence is transmitted only upon successful order fulfillment. If the process fails at any point, the subscriber may be notified of the order status by the automation server **6** and agent **4** dialog process..

The delivery of the final provisioning and configuration information to the automation agent **4** begins the final automation step of the process. **Fig. 5** shows the final step of provisioning all components of the subscriber installation for broadband access and beginning of service. The automation agent **4** uses the provisioning and configuration information delivered by the automation server **6** in the previous phase to configure individual parameters within each of the service affecting modules of the subscriber computer **1**. Examples of these modules are listed below but as will be appreciated by one of skill in the art, additional modules are possible and this list is not intended to be complete or all-inclusive.

At a base level, the automation agent can provision the computer networking software **58** for broadband service. All provisioning and configuration information that is required for the broadband modem **3** or **11** to access the network **8** may be directly implemented. The agent **4** software performs this provisioning by directly interfacing to each of the required modules. All network configuration and provisioning is entered into the broadband modem device directly. The various software elements resident within the subscriber machine **1** are directly configured for the desired operation by the agent. This process is contained with a workflow description that has been defined for each of these operations. The agent **4** receives the requested workflow(s) from the automation server **6** via the control dialog as described above. The agent **4** executes this workflow performing all required operations and collecting and reporting all requested status parameters. A record of each workflow step and its resulting status is collected by the agent **4** and forwarded the automation server **6** for inclusion into the subscriber profile database **24**, as shown in **Fig. 2**.

The automation process terminates with the subscriber computer **1** successfully connecting to the ISP **5** through the broadband network **8.**

The foregoing discussion is included to demonstrate preferred embodiments of the invention. It should be appreciated by those of skill in the art that the structure and techniques disclosed in the examples above represent structure and techniques discovered by the inventor to function well in the practice of the invention, and thus can be considered to constitute preferred modes for its practice. However, those of skill in the art should, in light of the present disclosure, appreciate that many changes can be made in the specific embodiments which are disclosed and still obtain a like or similar result without departing from the spirit and scope of the invention, which are set forth in the claims to follow.

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